PATENT

KL-US050678

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	***Confirmation No. 7520***
Kazumasa Fukazawa et al.	:	
Serial No. 10/681,253	:	
Filed: October 9, 2003	:	
For: BULLDOZER WITH IMPROVED VISIBILITY (As Amended)	:	

DECLARATION OF MASAYUKI MUKAINO UNDER 37 CFR §1.132

I, Masayuki Mukaino, pursuant to 37 CFR §1.132, hereby declare:

1. I am a co-inventor of the invention disclosed in the above-identified application.

2. I am currently a general manager of Small Size Machine Development Group of Komatsu Ltd in Japan. I have been working as an engineer in the construction equipment manufacturing field for the past 30 years. Therefore, I believe I possess experience, skill and knowledge of what one of ordinary skill in the construction equipment manufacturing field would possess.

3. A work vehicle disclosed in Japanese Utility Model Patent Application Publication No. S51-63032 to Yoshida (hereinafter "Yoshida publication") is a so-called "track loader", which is equipped with a bucket instead of a bulldozer blade. Unlike a bulldozer blade whose main function is to push material such as soil (i.e., excavation, soil transportation and land preparation operations), a bucket of the track loader is usually used for picking and loading material, and the bucket filled with material is moved up and down during loading operation. In other words, the track loader requires a different performance expected from a bulldozer. Therefore, the design object for a track loader disclosed in the Yoshida publication is completely different from that of a bulldozer. More specifically, in order to counterbalance load imparted on the bucket during loading operation, the Yoshida publication discloses a structure in which the radiator and the fan are placed on the rear side of the operator seat so that the center of gravity of the vehicle is placed toward the rear side (see, lines 9-11 on page 2). Generally, in a case of a track loader, the center of gravity is preferably

placed toward the rear of the vehicle as much as possible. More specifically, as shown in Fig. 1 of Exhibit A attached herewith, a bucket capacity of a track loader (which defines the specification of a track loader) is equal to a weight Wb imparted on the bucket, which is expressed as follows:

$Wb = Wg \times (L-Lg)/(Lb-L)$

Wb: Weight imparted on the bucket
Wg: Weight of the vehicle
L: Ground contact length
Lg: Distance between the center of gravity and a center of the sprocket
Lb: Distance between the bucket and the center of the sprocket

Therefore, it is desirable when designing a track loader to reduce the distance Lg as much as possible. See, Fig. 1 in Exhibit A.

On the other hand, in general, a position of the center of gravity of the bulldozer body is preferably set with respect to a ground contact length L and a distance Lg between the center of gravity and a center of the sprocket to satisfy the following relationship (see, Fig. 2 in Exhibit A):

$Lg/L \times 100 = 48\text{-}55\%$

Lg: Distance between the center of gravity and the center of the sprocket
L: Ground contact length

The reasons behind this are as follows:

(a) The vehicle stability on soft ground is improved by evening out the distribution of the contact pressure q (see, Fig. 3 of Exhibit A). Placing the center of gravity disproportionately toward the front or the rear causes the contact pressure q on one side of the vehicle to increase, and thus, the tracks of the bulldozer will be more prone to sink in ground (see, Fig. 4 of Exhibit A). Therefore, the vehicle body is tilted and/or slippage occurs, which decreases the work efficiency. Moreover, the center of gravity is placed approximately at the center of the ground contact length L so that there will be no variance between the push-up operation and the push-down operation on a slope (see, Figs. 5 and 6 in Exhibit A). More specifically, if the center of gravity is placed at the rear of the vehicle, the push-down work efficiency will be improved but the push-up work efficiency will be significantly reduced. Therefore, such a bulldozer is not usable in a field.

(b) The edge force Fb of the bulldozer blade (see, Fig. 7 of Exhibit A) is ensured by placing the center of gravity around the center position of the ground contact length L. The force Fb for penetrating the blade edge into the ground is generally expressed as follows:

$Fb = Wg \times Lg/Lb$

Fb: Blade edge force
Wg: Weight of the vehicle
Lg: Distance between the center of gravity and the center of the sprocket
Lb: Distance between the blade and the center of the sprocket

If this force Fb is small, the blade cannot penetrate into a hard surface. Therefore, in a case of a bulldozer, it is not desirable to place the center of gravity toward the rear of the vehicle (i.e., it is desirable to increase the distance Lg between the center of gravity and the center of the sprocket).

Accordingly, placing the center of gravity on the rear side of the vehicle as proposed in the Yoshida publication is undesirable in the bulldozer with a bulldozer blade. Thus, I believe one of ordinary skill in the art would not have considered it obvious to place the cooling module on the rear side of the bulldozer in view of the disclosure in the Yoshida publication because (1) counterbalancing the load imparted on the bucket is not a concern when designing a bulldozer, and (2) moving the center of gravity toward the rear side of the vehicle is not desirable when designing a bulldozer.

4. Moreover, even assuming for the sake of argument that the arrangement of the cooling module disclosed in the Yoshida publication were applied to a bulldozer, it would not have been obvious to place the cooling module in a cooling module recess formed between the tracks or between the first and second tank modules. More specifically, I believe it is not possible in the structure disclosed in the Yoshida publication to provide such a cooling module recess. In the Yoshida publication, it appears the steering case (housing a bevel gear, a brake and a clutch), the final drive and the fuel tank are placed on the rear side of the vehicle body (see, Exhibit B). Therefore, there is no space for providing a cooling module between the tracks or between the tank modules in the Yoshida publication. Accordingly, it is not obvious to modify the structure disclosed in the Yoshida publication to move the cooling

module in a cooling module recess formed between the tracks or between the tank modules.

5. Although the Yoshida publication discloses that a radiator and a fan are so big and heavy that they make an influence on gravity center location of a track loader, in the case of a modern bulldozer, I believe moving a position of a cooling module does not considerably influence overall weight balance of the bulldozer because the weight of the cooling module is relatively small with respect to the total weight of the bulldozer. This is because a cooling module is much lighter today than in the early 1970s. The Yoshida publication was filed in 1974. At that time, almost all radiators were mainly made of copper and most fans were made of steel. In order to meet the social demand for less fuel consumption and material recycling, however, most radiators are made of aluminum and many fans are made of plastics nowadays. Thus today's cooling module weighs less than one third of the corresponding size cooling module in the early 1970s. For example, with Komatsu D51EX-22, which is a medium size bulldozer, the operating weight of the bulldozer is about 12.6 ton (12600 kg) while the weight of the cooling module is only about 143 kg. Therefore, the cooling module accounts for only about 1.1 % of the total weight of the bulldozer. When a shift amount of the center of gravity caused by moving the cooling module from a front side to a rear side of the vehicle is estimated by using this bulldozer, the influence thereof is only about 1%. Even with a smaller size bulldozer such as Komatsu D20A-8E0, the operating weight of the machine is about 3.89 ton (3890 kg) while the weight of the cooling module is only about 37 kg, which accounts for only about 1 % of the total weight. Therefore, placing the cooling module on the rear side of the vehicle in the bulldozer does not create a tremendous imbalance in weight distribution, which requires considerable rearrangement of the parts of the bulldozer.

6. I believe one having ordinary skill in the art would reasonably ascertain that the drawings of U.S. Patent No. D483,043 to Akashima et al. (hereinafter "Akashima et al. patent") show only one tank disposed on the left side of the operator seat. In the drawings of the Akashima et al. patent, the part on the left side of the operator seat includes a fuel cap, and thus, it is reasonably understood that this part on the left side has a fuel tank. On the other hand, the part disposed on the right side of the operator seat does not seem to have a tank because it does not have a filing cap, and instead, it

appears to have a release latch (FIG. 2) with a butterfly hinge structure (FIG. 4). Therefore, the part on the right side of the operator seat appears to be a cover member that opens/closes by using the release latch. Therefore, I believe one having ordinary skill in the art would reasonably conclude, by looking at the drawings of the Akashima et al. patent, it is unreasonable to guess that the right side has a tank. The Akashima et al. patent claims priority to a Japanese design patent application which issued as Japanese Design Patent No. 1193249 S (Exhibit C). The Japanese Design Patent No. 1193249 S describes that a battery and a battery cover are disposed on the right side of the operator seat while a fuel tank is disposed on the left side.

7. The conventional bulldozer illustrated in FIG. 1 of the present application corresponds to Komatsu D41-6 model bulldozer. In this conventional bulldozer, the fuel tank extends laterally on the rear side of the cab and the hydraulic fluid tank is disposed on the right-rear side of the cab (please see Exhibit D). As shown in Exhibit D, the size of the fuel tank in the bulldozer is about three times as large as the size of the hydraulic tank. Therefore, although there are some variations with respect to positions of the tanks on the bulldozer, the fuel tank is commonly arranged to extend laterally on the rear side of the bulldozer to accommodate large size of the fuel tank. Thus, one having ordinary skill in the art would reasonably ascertain by looking at FIG. 1 of the present application that the fuel tank laterally extends on the rear side of the cab. Accordingly, for the sake of argument, if one having ordinary skill in the art were to modify the conventional bulldozer illustrated in FIG. 1 of the present application in view of the Pack publication to place the radiator on the rear side of the bulldozer, then the radiator would be placed behind the fuel tank. In other words, the fuel tank would interpose between the radiator and the cab in such a modified arrangement because there is nothing in these two references or the Akashima et al. patent that would provide one of ordinary skill in the art with a reason to move the fuel tank to the side and also create a cooling module recess between the tracks or the tanks.

8. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001

of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Masayuki Mukaino

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Dated: June 29 2010

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